given me interesting results, which, however, it will be difficult to describe in this short preliminary note. I will only say that all the bands specified above (except sometimes $104\frac{9}{10}$) are especially very marked in the earth which is most easily precipitated by ammonia, which has a sulphate least soluble in potassic sulphate, and whose chloride, very soluble in pure water, is difficultly soluble in concentrated hydrochloric acid.

"Shall we find two earths respectively characterised by the bands $104\frac{9}{10}$ and α $115\frac{1}{5}$?

"The production of my reversion spectrum appears to be analogous physically with the formation of the phosphorescence spectra obtained by Mr. Crookes at the positive pole in his high vacuum tubes containing certain compounds of yttria. The conditions of the two experiments are, however, very different practically speaking.

"It is a singular fact that the positions of the phosphorescence bands observed by Mr. Crookes with very pure compounds of yttrium, are sufficiently near those which I, on my part, have obtained with hydrochloric solutions of the earths separated as widely as possible from yttria, chemically as well as spectroscopically. My reversion spectrum cannot, I think, be attributed to yttrium, for on the one hand it is seen *brilliantly* with products which give no trace of yttrium rays by the direct spark, and on the other hand I have found it impossible to obtain it sharply from certain earths extremely rich in yttria.

"As soon as my work is sufficiently advanced to enable me to arrive at some definite conclusion, I shall have the honour of informing the Academy of it."

M. Lecoq de Boisbaudran added the following additional note:—

I have not yet finished the very long work undertaken in the hope of determining the nature of the above described phosphorescence spectrum.

This spectrum is now recognised as being identical with that which is ascribed to pure yttria by Mr. Crookes, and which this *savant* obtained under experimental conditions very different to mine. Nevertheless my latest observations, as well as the older ones, lead to the conclusion that yttria is not the cause of the spectrum bands observed. In my fractionations the phosphorescence spectrum regularly gets weaker as I advance towards the yttria end. With almost pure yttria the phosphorescence bands show themselves faintly or not at all, whilst they are brilliant with the earths which do not give by the direct spark the rays of yttrium to an appreciable extent.

The prodigious sensibility of Mr. Crookes's reaction, which detects a millionth part of his purified yttria, makes very singular this divergence which I am obliged to point out between the conclusions of the eminent English chemist and myself. Mr. Crookes has willingly undertaken to examine some of my products in his high-vacuum tubes; and, on the other hand, he has promised to send me the earths prepared by himself, so that I can examine them by my process. A comparison of these cross experiments, it is hoped, will throw some light on the question of the origin of the phosphorescence spectrum.

Another conclusion from my researches, a conclusion which I publish with a certain reserve because my work is not yet finished, is that the bands 105 and 115 do not belong to the same element. On this hypothesis, based on the fact that some of my products give 105 notably stronger than 115, whilst others show 115 brightly and 105 faintly, I will provisionally call $Z\alpha$ the earth characterised by 105, and $Z\beta$ the earth giving 115.

Space does not allow me to describe to-day the principal experiments or observations undertaken to find out what are $Z\alpha$ and $Z\beta$; this will form the subject of another memoir.

I should acknowledge here that Mr. Crookes was the first to see the phosphorescence spectrum of samarium. During the past year only this spectrum was pointed out to me by my learned friend M. Demarçay, to whom I had confided the secret of my method for the production of phosphorescence spectra by the reversion of the induced current. I then made a drawing of it.—*Comptes Rendus*, vol. c. p. 1437, June 8, 1885.

SOCIETIES AND ACADEMIES

LONDON

Chemical Society, June 18.—Dr. Hugo Müller, F.R.S., President, in the chair.—Messrs. Jos. F. Burnett and Harry M. Freear were formally admitted Fellows of the Society.—The following gentlemen were duly elected Fellows of the Society:—Messrs. Harry Haslett, Thomas Cradock Hepworth, Leonard de Koningh, Charles Langer, Arthur Richardson, James Sharp, James Pender Smith, James Spilsbury.—The following papers were read:—On the decomposition and genesis of hydrocarbons at high temperatures: I., the products of the manufacture of gas from petroleum, by Henry E. Armstrong and A. K. Miller, Ph.D. Having carried the examination of the various products of the decomposition of petroleum effected at high temperatures, in the manufacture of oil-gas (see paper in the *Journal* of the Society of Chemical Industry, September, 1884), as far as can usefully be done with the material originally dealt with, the authors now describe their methods and results; they remark, however, that these must be regarded as little more than preliminary, and that it will be necessary to repeat the investigation on a much larger scale, and to introduce new and improved methods. The products examined are (1) the portion of the compressed gas which combines with bromine; (2) the liquid deposited during compression of the gas to about ten atmospheres; (3) the portion of the tar which is volatile in steam. (1) By far the chief constituents of the mixture of bromides obtained by scrubbing the compressed gas by bromine are ethylene bromide and crotonylene tetrabromide, $C_4H_6Br_4$; propylene and butylene bromides have also been separated from it. The gas is practically free from hydrocarbons of the acetylene series capable of producing a precipitate in an ammoniacal cuprous solution. (2) The liquid deposited during compression of the gas is a complex mixture of olefines, of hydrocarbons of the C_nH_{2n-2} series, and of benzenes. The presence in it of *normal* amylene, hexylene, and heptylene has been demonstrated by the study of the products of oxidation of the various fractions. It is saturated with crotonylene, and contains a considerable quantity of the next homologue, C_5H_8; this latter hydrocarbon has not been previously described; it boils at 45°, and yields a tetrabromide which crystallises from alcohol in long flat prisms melting at 114°. All attempts to separate a hydrocarbon having the properties of Schorlemmer's hexoylene from the fraction boiling at 80°–82° have hitherto been unsuccessful, the statement previously made by one of the authors that this hydrocarbon was present having been based on determinations which have since been discovered to be faulty. The liquid deposited during compression of oil-gas is rich in benzene and toluene, but contains only traces of higher benzenes. (3) The steam distillate from the tar contains the less volatile hydrocarbons present in the liquid deposited during compression of the gas, together with a great variety of others. It is rich in hydrocarbons which are readily polymerised by sulphuric acid; these appear to be mainly members of the C_nH_{2n-2} series, such as Schorlemmer discovered in the light oils from cannel and boghead coal, and which yield no acid higher than acetic on oxidation. The three xylenes and mesitylene and pseudocumene are present in about the same relative proportions as in ordinary coal-tar; but in addition, the oil-gas tar contains certainly one—probably two—*higher* members of the benzene series: the amount obtained has not been sufficient, however, to permit of the precise determination of its nature. A very considerable amount of naphthalene may be separated from the tar; benzenoid hydrocarbons of higher boiling point than napthalene have also been obtained in small quantity. A certain, although relatively small, amount of a complex mixture of saturated hydrocarbons has also been separated from the tar: the quantity of material at their disposal has not enabled the authors to separate these to their satisfaction, and in a state sufficiently approaching purity; they are inclined to believe, however, that the mixture does not consist of paraffins, but of hydrocarbons of the C_nH_{2n} series—such as form the chief constituents of Russian petroleum. The hydrocarbons mentioned are by no means the sole constituents of the material examined, but merely those which have been proved to be present. The theoretical conclusions to be deduced from the results are in some respects interesting. It would appear that *only normal* olefines are present, and it is also remarkable that apparently this series is not represented by terms higher than heptylene. No true acetylenes have been detected; the crotonylene obtained is either *methylallene*, $CH_3{\cdot}CH{\cdot}C{\cdot}CH_2$, or *dimethylene-ethane*, $C_3H_2(CH_2)_2$, and from their behaviour on oxidation it is probable that the homologous hydrocarbons are closely related to it. Hence it may be inferred that in the formation of hydrocarbons of the C_nH_{n2-2} series at high temperatures from normal olefines of the formula $C_nH_{2n}+_1{\cdot}CH{\cdot}CH_2$ two atoms of hydrogen are removed in such a way that the terminal $CH_3{\cdot}CH_2$ radicle in the formula becomes either

$CH_3{\cdot}CH$ or $CH_2{\cdot}CH$; although the production of acetic acid on oxidation of the hydrocarbons favours the former hypothesis, it is not safe to accept it until several of the hydrocarbons of the C_nH_{2n-2} series have been isolated and more completely studied. The possibility that *saturated* hydrocarbons of the C_nH_{2n} series are among the products is especially noteworthy, although it must not be forgotten that such hydrocarbons might have been original constituents of the petroleum used in making gas. To settle this and other questions, it is proposed to prepare oil-gas from *solid* paraffin on a sufficient scale to obtain the quantity of material required for the investigation.—On the non-crystallisable products of the action of diastase upon starch, by Horace T. Brown and G. H. Morris, Ph.D.—Decomposition of carbonic acid gas by the electric spark, by H. B. Dixon, M.A., and H. F. Lowe, B.A. Various chemists have investigated the decomposition of carbonic acid by the electric spark. Experiments having shown that no explosion is propagated by a spark in a mixture of carbonic oxide and oxygen dried by standing over anhydrous phosphoric acid, it seemed of interest to repeat the experiments on the decomposition of carbonic acid when dried in a similar manner. Carbonic acid dried over anhydrous phosphoric acid was submitted to a series of induction sparks in an eudiometer by means of a chain composed of short pieces of platinum fused into small glass bulbs. The amount of decomposition varied from time to time, approaching no fixed limit. Similar results were found on introducing a Leyden jar into the secondary circuit of the Ruhmkorff, but the amount of decomposition was less. On passing a series of induction sparks through a dried mixture of carbonic oxide and oxygen, partial combination gradually took place, but no fixed limit was reached. Two similar eudiometers were prepared and fitted with wires made of an alloy of platinum and iridium, each wire ending in a bulb about 2 mm. in diameter. The bulbs were brought to the same distance apart in the two tubes. On bringing an equal volume of dried carbonic acid into the two tubes, and sending a series of sparks from one Ruhmkorff coil through both tubes at the same time, the gases in the two vessels were found to be equally affected, their volumes varying exactly together so long as the pressure was kept the same in the two tubes. The more feeble the spark, the greater was the decomposition of the carbonic acid found to be. When 100 volumes of dried carbonic acid were brought into one tube, and 150 volumes of a dried mixture of carbonic oxide and oxygen were brought into the other, and a series of sparks were passed through both from the same coil, the volume of carbonic acid increased, and the volume of carbonic oxide and oxygen diminished, until after some hours they became equal. On a further prolonged passage of the spark the two volumes altered together, sometimes increasing and sometimes diminishing, as the nature of the spark varied. A coil of fine platinum wire was heated by an electric current to whiteness in dried carbonic acid. No permanent alteration of volume was produced. When a similar coil of platinum wire was heated in a mixture of dried carbonic oxide and oxygen, it glowed intensely for some minutes, and complete combustion was found to have taken place between the two gases. No flame was visible around the wires.—On the influence of silicon upon the properties of cast iron, by Thomas Turner, Assoc.R.S.M.—Eleven months' experience with toughened glass beakers, by R. J. Friswell.—Bromo-derivatives of diphenyl, tolylphenyl, and ditolyl, by Prof. Carnelley and Andrew Thomson.—Note on the influence of strain upon chemical action, by Prof. Carnelley and James Schlerschmann.—On the non-existence of gaseous nitrous anhydride, by William Ramsay, Ph.D.—On the causes of the decrepitations in samples of so-called explosive pyrites, by B. Blount.—On the specific action of a mixture of sulphuric and nitric acids upon zinc in the production of hydroxyamine, by E. Divers, M.D., F.R.S., and T. Shimidzu, M.E.—On the action of pyrosulphuric acid upon certain metals, by E. Divers, M.D., F.R.S., and T. Shimidzu, M.E.—On the constitution and reactions of liquid nitric peroxides, by E. Divers, M.D., F.R.S., and T. Schmidzu, M.E.—On the behaviour of stannous chloride towards nitric oxide and towards nitric acid, by E. Divers, M.D., F.R.S., and T. Haga.—Preliminary note on the reaction between mercurous nitrate and nitric oxide, and between mercurous nitrate and nitrites, by Edward Divers, M.D., F.R.S., and Tamemasa Haga.—On some derivatives of anthraquinones, by A. G. Perkin and Dr. W. H. Perkin, jun.

Royal Microscopical Society, June 10.—Rev. Dr. Dallinger, F.R.S., President, in the chair.—Mr. Suffolk exhibited a collecting bottle (made by Mr. Stanley) with flat sides, which had been worked to a true surface, through which an ordinary objective could be focussed with perfect definition.—Prof. Stewart called attention to a specimen he exhibited under the microscope, and a model showing the special eyes of Chitonidæ described by Prof. Moseley.—Mr. Wright's letter with reference to Dr. Anthony's criticism on his note on the structure of the tongue of the blow-fly was read, in which he gave all the credit of the discovery of the suctorial organs to Dr. Anthony, whose paper on the subject had been previously unknown to him. He also sent a slide of the blow-fly proboscis, mounted by Mr. Sharp, whose method of preparation and mounting in the biniodide of mercury solution was described.—Mr. Suffolk said he had examined Mr. Wright's first specimen, and he had also made a similar specimen of his own; but the conclusion he came to was that the appearances described were due to some sort of diffraotive effect and that they were in fact out-of-focus appearances.—Mr. J. Mayall, jun., called attention to the fact that a Nobert 19-band test-plate had been successfully mounted in Prof. Hamilton Smith's medium, having a refractive index of 2·4, the results being to render the lines very much more visible than had been the case before. The preparation was made by Dr. van Heurck, and was attended with considerable difficulty. He now thought it possible to improve upon the photomicrographs of the late Dr. Woodward of Washington, for, the lines being mounted in the highly refractive medium, could be illuminated by immersion means, so that an objective of higher aperture than any employed by Dr. Woodward could be used to resolve them. He hoped to try some experiments in photographing the test-plate by means of Powell and Lealand's new homogeneous immersion, 1/12th of 1·5 N.A.—Mr. Crisp said that they had received from Prof. W. A. Rogers, of Cambridge, U.S.A., a collection of upwards of 60 slides, showing the action of a diamond in ruling lines upon glass. The series was accompanied by a descriptive paper, which, when printed in the *Journal*, would enable the Fellows to compare it with the slides. The President said that Prof. Rogers had expressed the hope that some one might feel sufficiently interested in the subject to make a careful study of the slides. They had not yet had any opportunity either of examining the slides or reading the paper, but their best thanks were due to Prof. Rogers for his valuable donation.—Theiler's "Universal Pocket Microscope" was exhibited by Mr. Crisp.—Dr. Maddox said that since the last meeting he had continued his experiments on the feeding of insects with bacilli, and had fed both the wasp and the blow-fly with the Anthrax bacillus. They had lived on through the month until that very hot day when the thermometer rose to 136° in the sun, when they succumbed to what he believed was heat asphyxia, so that he was unable to attribute their deaths to any effect of the bacilli.—Mr. Waters read his paper on the use of the avicularian mandible in classification, the subject being illustrated by drawings.—Mr. Cheshire described a method of mounting in glycerine, which he had found of great advantage with the particular class of preparations (insect anatomy) with which he had lately been engaged; he further illustrated his meaning by drawings upon the blackboard and by the exhibition of specimens which were handed around for inspection.—Prof. M. N. Dutt's letter was read, accompanying some unknown powdery substance found near Delhi.

SYDNEY

Linnean Society of New South Wales, May 27.—Prof. W. J. Stephens, F.G.S., President, in the chair.—The following papers were read:—Note on the brain of *Halicore australis*, Owen, by N. de Miklouho-Maclay.—On a new species of *Haloragis* from New South Wales, by Baron F. von Müller, K.C.M.G., &c.—Two new Australian Lucanidæ, by William Macleay, F.L.S., &c.—A list of the *Cucujidæ* of Australia, with notes and descriptions of new species, by A. Sidney Olliff, Assistant-Zoologist, Australian Museum. In this paper, which is a preliminary contribution towards a monograph of the family, fourteen species are added to the Australian fauna. Ten new species are described, including five belonging to the genus *Læmophlœus*. A fine new *Brontes* from Port Darwin and the Richmond River, measuring 14 mm. in length, is characterised under the name of *B. macleayi*. It is distinguished from all the Australian species of the genus by its rather convex elytra, and in having the prothorax with the anterior angles very prominent and the sides feebly serrate. A table showing the geographical distribution of the species is added.—Description of some new fishes from Port Jackson, by J. Douglas-Ogilby, Assistant Zoologist, Australian Museum. Four fishes are here described—a new genus and species of Blenniidæ—*Petraites heptaolus*, also *Platycephalus macrodon*, *Percisnova-cambria*, and *Latris ramsayi*, the latter remarkable in its want of villiform teeth.—Note on *Neoanthias guntheri*, Cast, by J. Douglas-Ogilby, Assistant Zoologist, Australian Museum.—Notes on the geology and water supply of the interior of New South Wales, by the Rev. J. Milne Curran, F.G.S. The author points out the conditions under which the plains of the western interior have been formed, explains the river system or drainage of the level country, and indicates the sources of the subterranean waters which are met with in the gravel formations generally known as "drifts."—Some remarks on the fertilisation of the genus *Goodenia*, by E. Haviland.—Notes on a medusa from the tropical Pacific, by R. von Lendenfeld, Ph.D.—Contributions to the zoology of New Guinea; notes on birds from the Astrolabe Range, with descriptions of some new species, by E. P. Ramsay, F.R.S.E., &c. In this paper two new forms of Paradise birds, *Parotia lawesii* and *Lophorina superba minor*, are described, the former differing chiefly from its ally from Mount Arfak in the shape of the frontal crest and olive-coloured shield, the latter chiefly in size; measurements of specimens from both districts are given. The remaining portion of the paper gives a list of species hitherto only recorded from Mount Arfak.—Description of a new species of Collyriocincla, from Queensland, by E. P. Ramsay, F.R.S.E., &c.

PARIS

Academy of Sciences, July 13.—M. Bouley, President, in the chair.—A method of determining the absolute co-ordinates of the polar stars without the necessity of ascertaining the instrumental constants (declinations), by M. Lœwy.—Telluric spectra, by M. J. Janssen. The author reports the completion of the apparatus prepared in M. Ducretet's *ateliers* for the study of the gases in the terrestrial atmosphere and of the vapour of water.—Note in reference to M. Stieltjes' communication on a uniform function, by M. Hermite.—On the motion of a heavy revolving body attached by a point of its axis (continued), by M. G. Darboux.—On the theoretic aim of the late M. Henri Tresca's chief studies in the field of mechanics, by M. de Saint-Venant.—A study of the action of dust-particles left to themselves, by M. Chevreult. The particles in question came from a factory in Paris, where the hair of cows and calves is prepared for the spinning-mills of England. They have been left for a twelvemonth on a sheet of red paper in a cylindrical vessel, where they have presented certain mechanical, physical, and chemical phenomena studied and photographed by the author.—Fundamental principles of the new science of dynamic meteorology: reply to M. Mascart's note of June 29 (second part), by M. H. Faye.—Remarks on the same subject in reply to M. Faye, by M. Mascart.—Magnesia; its preparation from sea-water and application to various branches of industry, by M. Th. Schlœsing.—On the central nervous system of *Tethys leporina*, by M. H. de Lacaze-Duthiers.—Note on the homography of two infinitely-extended solids, by M. Sylvester.—On the nature of the transformations undergone by extenuated charbon virus cultivated in compressed oxygen, by M. A. Chauveau.—Remarks on Dr. Brouardel's report on his recent mission to Spain, by M. Pasteur. If Dr. Ferran has really discovered a remedy against cholera he will stand in no need of any Minister's signature; all mankind will welcome a guarantee of the moral and material value of his discovery. To persist in refusing to see this would justify all suspicions, as has become evident since the publication of the replies made to the French Mission in Spain. Dr. Ferran now wishes to withdraw from the position taken up by him, as appears from his fresh note addressed to the Academy. On this issue Dr. Brouardel will be the first to congratulate himself.—Remarks accompanying the presentation of the second edition of his work on the origin of the world, by M. H. Faye.—Protection against cholera by means of hypodermic injections of pure cultivations of the comma bacillus, by M. Jaime Ferran. The Spanish physician describes the results obtained from his method as quite astounding, and maintains that it offers an absolute remedy against cholera. The dangers of attack and death begin to disappear five days after vaccination, and the immunity from further attack increases with each successive injection. The period of immunity cannot yet be accurately determined, but a minimum of two months may already be confidently anticipated.—Observations of Barnard's new comet made at the Paris Observatory (equatorial of the West Tower), by M. G. Bigourdan.—On a law of reciprocity in the theory of displacement of a solid body, by M. A. Schœnflies.—On a uniform function in mathematical analysis, by M. Hermite.—Observation of a cloud of black particles which were seen to cross the solar disk with varying velocity on August 28, 1871, by M. E. L. Trouvelot.—Indices of refraction for some crystallised alums, by M. Ch. Soret.—On the spectra of absorption of some colouring matters, by MM. Ch. Girard and Pabst.—On the electric resistance of copper at a temperature of 200° C. below zero, and on the isolating point of liquid oxygen and nitrogen, by M. S. Wroblewski.—Heat of formation of the bromide and iodide of antimony, by M. Guntz.—On the double bromides of gold and phosphorus, and on a chlorobromide, by M. L. Lindet.—On a method of producing the alkaline earthy manganites, by M. G. Rousseau.—On the development of the Hematodes, and especially of *Ascaris megalocephala*, by M. de Lacaze-Duthiers.—On *Adamsia pallatia* and its association with *Eupagurus Prideauxi*; a hitherto unrecorded instance of symbiosis, by M. Faurot.—On the parasites of *Mæna vulgaris*, by M. R. Saint-Loup.—First traces of the presence of Permian rocks in Brittany, by M. Ed. Bureau.—On the Permian formations occurring in the departments of Aveyron and Hérault, by M. J. Bergeron.—On the distribution of luminous intensity and visual intensity in the solar spectrum, by M. Aug. Charpentier.—On a case of cebocephaly (atrophy of the nasal process), complicated with partial anencephaly, observed in a foal, by M. Dareste.—Attenuation of the cholera virus, by MM. Nicati and Reitsch. From a series of experiments made on the guinea-pig the authors conclude that the cultivated virus loses all efficacy after a few weeks.—Photographic experiments in a balloon, by M. G. Tissandier. During an ascent on June 19, 1885, in Paris, the author, aided by M. J. Ducom, obtained some excellent photographs at elevations ranging from 605 to 1100 metres. By the new processes of instantaneous photography these operations have been greatly facilitated, and may render effective service in time of war.—Remarks on a partial earthquake felt only on the surface of the ground in the Department du Nord, by M. Virlet d'Aoust.—Note on the microzymas of the Jequirity plant, by MM. J. Béchamp and A. Dujardin.

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